

"actual" geometry of space, and he would probably assent to Poincaré's dictum that the science of mathematics is neither true nor false.

There is one remarkable statement made which deserves mention. Dr. Mannoury says that in December, 1818, F. K. Schweikart sent to Gauss a note asserting the existence of a geometry in which the sum of the angles of a triangle is less than two right angles, and in which the altitude of an isosceles triangle with a finite base has a finite upper limit. This goes far to demolish the claim made for Gauss that he was the first to assert the possibility of a consistent system of geometry distinct from that of Euclid.

G. B. M.

THE PROTOZOA: AN IMPRESSIONIST SKETCH.

Protozoölogy. By Prof. Gary N. Galkins. Pp. 349. (New York and Philadelphia: Lea and Febiger; (London: Baillière, Tindall and Cox, 1909.) Price 15s. net.

TO attempt to condense our present knowledge of the Protozoa into some three hundred pages is to anyone acquainted with the subject—to attempt the impossible. This book, however,

"does not aim at being an exhaustive treatise on the Protozoa; it aims, rather, to give an introduction to the study of modern protozoology as seen from the author's point of view."

It would therefore be unfair to draw comparisons with Doflein's recent masterpiece on the subject which appeared almost simultaneously.

As we differ fundamentally from the author in many matters of interpretation—both as regards general principles and detailed facts—we can here consider only a few points which a perusal of the work has suggested.

With regard to the tentative classification of the Protozoa which is adopted, we can only say that it is, perhaps, as good as any which has so far been advocated. With our present knowledge, it is not possible, we believe, to arrive at a satisfactory classification of the whole group. At present there must be many tadpoles among our fish. It may be noted, however, that the author does not accept Hartmann's group "Binucleata"—for trypanosomes and their allies and *Hæmosporidia*—and in this we heartily agree with him. It may be noted, further, that the *Spirochaeta*s are classified (with some reservation) among the *Mastigophora*; the *Mycetozoa* are ranked under the *Rhizopoda*; the *Opalinidae* are placed among the *holotrichous Ciliata*; and the *Mastigamœbæ* are placed, in the order *Monadida*, with the *Mastigophora*. Though these groupings are usual, they are none the less, we believe, unjustifiable in the light of recent work.

In dealing with the trypanosomes, the author adheres to Schaudinn's much-debated work, because he finds

"the schematic figures and categorical descriptions of Schaudinn's original contribution are still the most convincing of all such attempts to describe the nuclear changes."

The life-cycle of *Paramecium* is described as a "typical" one. With this we cannot agree, because we consider the *Ciliophora* to be very different from all other organisms. Moreover, we regret to find no allusion to the recent important work of Enriques and others in this connection.

A remarkable account of autogamy in *Amoeba limax* is given, apparently from the author's own (unpublished?) observations, though no indication of this is given. Autogamy is again alleged to take place in *Amoeba proteus*, though this has not been by any means proved. It is disappointing to find no reference, in this connection, to Prandtl's important work on *Cryptodiffugia* ("Allogromia").

It seems to us that undue prominence has been given to many very questionable organisms, such as "*Cytorrhycles variolae*," the "Negri bodies," &c. (described, by the way, under "Parasitic *Rhizopoda*"), whilst many important life-histories, e.g. *Opalina*, *Mastigella*, *Trichosphaerium*, *Stylorhynchus*, &c., receive little more than passing mention.

The remarkable form *Aggregata* is mentioned only in the classification, where it is placed among the *cephaline gregarines*! One can only suppose that this is an oversight; and we regret to see that the very doubtful work of Dallinger and Drysdale has found its way into yet another text-book.

Throughout the book, generic names are often written in ordinary type, without a capital letter, although in many cases the customary convention is adopted—frequently in the same paragraph. We think this is to be deplored, more especially so because medical men—to whom, on account of the large amount of space devoted to parasitic forms, the book will specially appeal—are at present particularly prone to write zoological names incorrectly. In addition, the author's apparent dislike of diphthongs causes him to adopt the spellings not only *Paramecium* (correctly), but also *Ameba*, *Actinosphaerium*, *Spirocheta*, &c., and even *Jenia* (for *Joenia*).

These criticisms are, however, of minor points. The chief value of the book lies in the fact that it gives us a unified picture of the many problems of protozoology as they present themselves to a worker who has devoted many years of original research to his subject. Without doubt, the book will be welcomed by many, because there exists no other modern work in English which attempts to deal with the present state of protozoology within the compass of a single volume.

C. CLIFFORD DOBELL.

BEE-KEEPING IN AMERICA.

How to Keep Bees for Profit. By Dr. D. E. Lyon. Pp. xii+329. (New York: The Macmillan Company; London: Macmillan and Co., Ltd., 1910.) Price 6s. 6d. net.

THIS is a book on bee-keeping in the United States. The author is a well-known bee-keeper, and an entertaining writer; he has a happy way of briefly explaining the chief operations of the apiary in a personal style that does not weary the reader. Dr. Lyon tells us that many years ago he acquired the "bee fever," "from which he has never recovered,

and never expects to recover." The chief symptoms of this affection, enthusiasm and optimism, pervade his book, but he is careful not to exaggerate the profits of bee-keeping; the methods and appliances he describes are all well known and well tried, though some of them are unsuited to bee-keeping in England.

The clipping of queens' wings to prevent swarms absconding is recommended, but this practice is seldom employed in England, chiefly because the queen is likely to perish in the grass unless the bee-keeper happens to be present at the moment of swarming to find her and put her back into the hive.

The author, in saying (p. 52) that "it has not been definitely determined whether in laying an infertile egg from which springs the drone, the queen lays it through choice, or is compelled to owing to the increased size of the drone cell," seems to be unacquainted with the fact that a queen will sometimes lay large numbers of fertile eggs in drone cells.

Among the enemies of the honey-bee that the American apiarist has to contend with are skunks, "who seem to have a fondness for bees, and the little rascals will, in the shadow of night, scratch on the alighting board of a hive to lure the sentinels out for investigation, only to be gobbled up by their odoriferous enemies." "In warm climates the dragon-flies kill a large number of virgin queens when in flight, and in certain sections they are so numerous that commercial queen-rearing is well-nigh an impossibility."

Dr. Lyon finds he is less liable to be stung in a white cotton suit than when he wears dark woollen clothes, and wonders whether it is because the bees detect the animal scent in the woollen goods or have a natural aversion to black.

On pp. 12 and 13 we are unfortunately informed that the eggs of workers, drones, and queens hatch respectively in twenty-one, twenty-four, and sixteen days, instead of that these are the periods taken by these bees to develop from the time the egg is laid; but this will no doubt be put right in a second edition, which is likely to be wanted before long by the great nation across the ocean, in whose favoured country the bee-keeping industry has grown to great importance.

Very attractive features of the book are its handy size, clear, large type, and beautiful photographs. Bee-keepers, both prospective and actual, will appreciate this evident effort of printers and publishers to give them their best.

F. W. L. SLADEN.

OUR BOOK SHELF.

Ektropismus oder die physikalische Theorie des Lebens. By Felix Auerbach. Pp. v+99. (Leipzig: W. Engelmann, 1910.) Price 2.60 marks.

EACH fresh theory of life which is put forward by thinkers will doubtless find a certain number of adherents, even if, as in the present instance, it is unsupported by anything in the nature of experimental evidence. This sort of evidence is just the kind which it is so difficult to obtain, and new theories lead one but very little nearer to the solution of the great problem. Auerbach's brochure contains nothing really

new, and he clothes his ideas in a considerable amount of verbiage. No one can doubt that life with its characters of growth and development is a form of energy, but the psychical aspects of life have always been a stumbling-block in the full acceptance of a purely physical theory. Ectropism, the term selected by the author, is not entirely a physical theory; he tells us that ectropism is neither materialism nor idealism, neither formalism nor phenomenalism; it is certainly not monism, but, in a certain sense, it is dualistic. From this one learns what ectropism is not, and one could wish that the rest of the book, which tells us what it is, was equally explicit. We must, however, leave those of our readers who are interested in speculations of this nature to unravel it for themselves.

A Text-book of Physical Chemistry, Theory and Practice. By Dr. Arthur W. Ewell. Pp. ix+370. (Philadelphia: P. Blakiston, Son and Co., 1909.) Price 2.25 dollars net.

TEXT-BOOKS of physical chemistry are generally written by chemists, which is natural enough, since the subject is much more widely studied by chemists than by physicists. It is therefore a pleasant change to come across a text-book of physical chemistry written by a physicist. As one might expect, the treatment is less descriptive and more mathematical, with greater precision in the definition of physical magnitudes and greater strictness in the deductions. The work under review is an excellent example of this type, being brief, pointed, and consistent. It is not exactly a book which the young chemist without previous knowledge of the subject would be likely to read with profit, but it can be warmly recommended to those who, either by hearing a course of lectures, or by the perusal of one of the more chemical text-books, have attained some acquaintance with the subject-matter and desire to systematise their knowledge.

The value of the book is greatly enhanced by the inclusion of questions and mathematical exercises on the subjects discussed. The directions for practical work err occasionally on the side of conciseness, but should in any case prove useful to the student who cannot always have a demonstrator by his side.

Vorträge und Aufsätze über Entwicklungsmechanik der Organismen. Edited by Prof. W. Roux. Heft x., Über die gestaltliche Anpassung der Blutgefässe. By Prof. Dr. Albert Oepel. Pp. ix+182. (Leipzig: W. Engelmann, 1910.) Price 4.40 marks.

THIS is a useful and interesting contribution to the study of development, dealing, as its name indicates, with the blood-vessels, and the way in which they are adapted to the needs of the organs or tissues they supply and to the changes which these undergo. This adaptation is divided into three periods, the first during which inherited characters determine the course of development; the third is the period of full functional life during which the changes are the result of functional stimuli; the second or intervening period is that in which both factors come into play. The changes dealt with in detail are not merely those dependent on quantity of the blood supply; but the various coats of the blood-vessels, especially the muscular coat, with its nerves, undergo alterations in consonance with the needs of the tissues. An important section deals with the collateral circulation, and another, by no means the least interesting, with the recent remarkable results which have attended attempts to transplant organs from one animal to another. The value of the book is increased by a copious bibliography.